Revision: Week 10 Due: 5pm on Oct 30th

Instructions

- Discussion is allowed and infact encouraged
- Answers **must** be written by yourself.
- All sources (including discussions) that are used to reach the solution must be mentioned.

(1) If $A \leq_m B$ and B is a regular language, does that imply that A is a regular language? Why or why not? [4].

(2) Show that $\leq_m$ is a transitive relation. [3].

(3) Show that A is Turing recognisable iff $A \leq_m A_{TM}$ [4]

(4) Show that both conditions in Rice's

theorem are necessary.

That is,

(i) Give an example of a trivial property and show that languages with this property are decidable.

(ii) Give an example of a non-trivial property, which is decidable, s.t. $\exists M_1, M_2$ for which $L(M_1) = L(M_2)$ but $\langle M_1 \rangle \in P$ & $\langle M_2 \rangle \notin P$.

↳ P is the property [2+3]

(5) Answer True or False, giving reasons for your answer.

(i) $3^n = 2^{O(n)}$

(ii) $1 = o(1/n)$ [2+2]